

REMARKS

Responsive to the preliminary determination of lack of unity imposed in the outstanding Official Action, applicants hereby provisionally elect Group I, claims 79-89 and 98, with traverse.

The reasons for traverse follow.

The inventions listed in Groups I and II do relate to a single general inventive concept under PCT Rule 13.1. According to PCT Rule 13.2, there is a technical relationship among those inventions involving one special technical feature.

This special technical feature is the stable composition of Group I which is not anticipated by U.S. Patent 4,463,071, contrary to the assertion made in the outstanding Official Action.

U.S. Patent 4,463,071 relates to batteries containing an anode, a cathode, and a molten, non-aqueous electrolyte wherein said electrolyte comprises an admixture of aluminium halide and 1,2,3-trialkylimidazolium halide. The aluminium halides as described in this US patent are not stable in the air nor in water. Consequently, the aluminium halides cannot be used in the present invention which relates to stable compositions.

Moreover, U.S. 4,463,071 does not mention the use of an ionic liquid as a matrix or as a reaction support.

The products as described in US patent 4,463,071 are not easily recyclable after use because of water sensibility, which irreversibly destroys the chloroaluminate ionic liquid.

Chloroaluminates ionic liquids are not inert reaction media and, therefore, their use as matrices could be deleterious to quite a large number of reagents.

The formation of ionic liquids by treatment of halide salts with Lewis acids dominated the early years of this area of chemistry of ionic liquids. The great breakthrough came in 1951, with the report by Hurley and Weir on the formation of a salt that was liquid at room temperature, based on the combination of 1-butylpyridinium with  $\text{AlCl}_3$  in the relative molar proportions 1:2 [F.H. Hurley and T.P. Wier, *J. Electrochem. Soc.* **1951**, 98, 203]. More recently, the groups of Osteryoung and Wilkes have developed the technology of room temperature chloroaluminate melts based on 1-alkylpyridinium [(a) H.L. Chum, V.R. Koch, L.L. Miller, and R.A. Osteryoung, *J. Am. Chem. Soc.* **1975**, 97, 3264. (b) J. Robinson and R.A. Osteryoung, *J. Am. Chem. Soc.* **1979**, 101, 323] and [RMIM]<sup>+</sup> cations [J.S. Wilkes, J.A. Levisky, R.A. Wilson, and C.L. Hussey, *Inorg. Chem.* **1982**, 21, 1263]. In general terms, treatment of a quaternary halide salt  $\text{Q}^+\text{X}^-$  with a Lewis acid  $\text{MX}_n$  results in the formation of more than one anion species, depending on the relative proportions of  $\text{Q}^+\text{X}^-$  and  $\text{MX}_n$ .

The chloroaluminates are not the only ionic liquids prepared in this manner (other Lewis acids:  $\text{AlEtCl}_2$  [Y. Chauvin,

S. Einloft, and H. Olivier, *Ind. Eng. Chem. Res.* **1995**, *34*, 1149.  
(b) B. Gilbert, Y. Chauvin, H. Olivier, F. DiMarco-van Tiggelen, *J. Chem. Soc., Dalton Trans.* **1995**, 3867],  $\text{BCl}_3$ ,  $\text{CuCl}$  [Y. Chauvin and H. Olivier-Bourbigou, *CHEMTECH* **1995**, *25*, 26], and  $\text{SnCl}_2$  [G.W. Parshall, *J. Am. Chem. Soc.* **1972**, *94*, 8716]). In general, the preparative methods employed for all of these salts are similar to those indicated for  $\text{AlCl}_3$ -based ionic liquids. The most common method for the formation of such liquids is simple mixing of the Lewis acid and the halide salt, with the ionic liquid forming on contact of the two materials. The reaction is generally quite exothermic, which means that care should be taken when adding one reagent to the other. Although the salts are relatively thermally stable, the build-up of excess local heat can result in decomposition and discoloration of the ionic liquid. The water-sensitive nature of most of the starting materials (and ionic liquid products) means that the reaction is best carried out in a dry box. Similarly, the ionic liquids should ideally also be stored in a dry box until use. It is generally recommended, however, to prepare only enough liquid to carry out the desired task, as decomposition by hydrolysis will inevitably occur over time unless the samples are stored in vacuum-sealed vials. If a dry box is not available, the preparation can also be carried out by use of a dry, unreactive solvent (typically an alkane) as a "blanket" against hydrolysis. At the end of the reaction, the ionic liquid forms an immiscible layer beneath the protecting

solvent. The ionic liquid may then either be removed by syringe, or else the solvent may be removed by distillation before use. In the former case it is likely that the ionic liquid will be contaminated with traces of the organic solvent [J. H. Davis, Jr., C. M. Gordon, C. Hilgers, and P. Wasserscheid in *Ionic Liquids in Synthesis*. Edited by P. Wasserscheid, T. Welton 2002 Wiley-VCH Verlag GmbH & Co. KGaA].

The present invention relates to a stable composition comprising, in solution, an ionic liquid of formula  $A_1^+X_1^-$  providing a liquid matrix; and one functionalized salt of formula  $A_2^+X_2^-$  providing a soluble reaction support and being dissolved in the liquid matrix so that the composition forms a stable homogeneous phase.

Therefore, in view of the discussion above, it is believed to be apparent that the lack of unity determination set forth in the outstanding Official Action is improper and should be withdrawn.

Claims 65-78 and 90 were rejected under 35 USC 112, second paragraph, as being indefinite. Applicants respectfully disagree.

The Official Action stated that the claims do not set forth any steps involved in a method or process, and it is unclear what method or process applicants intend to encompass. However, applicants respectfully submit that claim 65, from which claims 66-78 depend, and claim 90 do recite method steps.

Specifically, claim 65 is directed to a method of organic synthesis in a homogeneous phase on a soluble reaction support that comprises dissolving a soluble reaction support in a liquid matrix to provide organic synthesis on the soluble reaction support. Claim 90, recites a method of organic synthesis that comprises combining a liquid matrix with at least one functionalized salt to prepare the composition of claim 79, wherein the organic synthesis is continuous, discontinuous, combinatorial, parallel, and/or for preparing libraries of products. Accordingly, applicants believe that claims 65-78 and 90 do indeed recite at least one active positive step (i.e. dissolving in claim 65 and combining in claim 90).

Therefore, applicants believe that the present claims are definite and respectfully request that the indefiniteness rejection be withdrawn.

In view of the above, it is believed that applicants are entitled to an action on the merits of all the pending claims, in their full scope, in the present application. Such an action is accordingly respectfully requested.

The Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any

overpayment to Deposit Account No. 25-0120 for any additional  
fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17.

Respectfully submitted,

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